Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

# General

## Title

Ventriculoperitoneal (VP) shunt malfunction: percentage of initial VP shunt placement procedures performed on children between 0 and 18 years of age that malfunction and result in shunt revision within 30 days of initial placement.

## Source(s)

Jernigan S, Berry JG, Graham D, Goumnerova L. Ventriculoperitoneal (VP) shunt malfunction rate in children. Boston (MA): Boston Children's Hospital, Center for Patient Safety and Quality Research; 2014 May 14. 4 p.

# Measure Domain

## Primary Measure Domain

Clinical Quality Measures: Outcome

## Secondary Measure Domain

Does not apply to this measure

# Brief Abstract

## Description

This measure is used to assess the percentage of initial ventriculoperitoneal (VP) shunt placement procedures performed on children between 0 and 18 years of age that malfunction and result in shunt revision within 30 days of initial placement.

## Rationale

Ventricular shunt malfunction places children at risk for potentially irreversible neurologic system deficits and death if not treated promptly. Shunt malfunction treatment is associated with the need for hospitalization and re-operation. The hospitalization itself is disruptive to the child and family, which may lead to impaired quality of life. The need for re-operation places the child at additional risk for central nervous system infection and other adverse events.

## Evidence for Rationale

Jernigan S, Berry JG, Graham D, Goumnerova L. Ventriculoperitoneal (VP) shunt malfunction rate in children. Boston (MA): Boston Children's Hospital, Center for Patient Safety and Quality Research; 2014 May 14. 4 p.

Simon TD, Riva-Cambrin J, Srivastava R, Bratton SL, Dean JM, Kestle JR, Hydrocephalus Clinical Research Network. Hospital care for children with hydrocephalus in the United States: utilization, charges, comorbidities, and deaths. J Neurosurg Pediatr. 2008 Feb;1(2):131-7. PubMed

## Primary Health Components

Hydrocephalus; initial cerebrospinal ventriculoperitoneal (VP) shunt placement; shunt malfunction; management of initial and multiple shunt revisions; prevention and management of shunt infections; children

## Denominator Description

The total number of initial cerebrospinal ventriculoperitoneal (VP) shunt procedures performed on children between the ages of 0 and 18 years (see the related "Denominator Inclusions/Exclusions" field)

## Numerator Description

The number of initial ventriculoperitoneal (VP) shunt placement procedures performed on children between 0 and 18 years of age that malfunction and result in shunt revision within 30 days of initial placement (see the related "Numerator Inclusions/Exclusions" field)

# Evidence Supporting the Measure

## Type of Evidence Supporting the Criterion of Quality for the Measure

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

## Additional Information Supporting Need for the Measure

- Despite advances in ventricular shunt care, analyses continue to demonstrate wide variation in shunt malfunction rates among different institutions.
- Variation in shunt malfunction rates has been demonstrated across racial/ethnic groups.
- Children who require on-going cerebrospinal fluid diversion with a ventricular shunt have a major risk of morbidity and mortality. These children are experiencing high rates of life-threatening shunt malfunction.

## Evidence for Additional Information Supporting Need for the Measure

Berry JG, Hall MA, Sharma V, Goumnerova L, Slonim AD, Shah SS. A multi-institutional, 5-year analysis of initial and multiple ventricular shunt revisions in children. Neurosurgery. 2008 Feb;62(2):445-53; discussion 453-4. PubMed

Jernigan SC, Berry JG, Graham DA, Goumnerova L. The comparative effectiveness of ventricular shunt placement versus endoscopic third ventriculostomy for initial treatment of hydrocephalus in infants. J Neurosurg Pediatr. 2014 Mar;13(3):295-300. PubMed

Prusseit J, Simon M, von der Brelie C, Heep A, Molitor E, Volz S, Simon A. Epidemiology, prevention and management of ventriculoperitoneal shunt infections in children. Pediatr Neurosurg. 2009;45(5):325-36. PubMed

Shah SS, Hall M, Slonim AD, Hornig GW, Berry JG, Sharma V. A multicenter study of factors influencing cerebrospinal fluid shunt survival in infants and children. Neurosurgery. 2008 May;62(5):1095-102; discussion 1102-3. PubMed

Simon TD, Butler J, Whitlock KB, Browd SR, Holubkov R, Kestle JR, Kulkarni AV, Langley M, Limbrick DD, Mayer-Hamblett N, Tamber M, Wellons JC, Whitehead WE, Riva-Cambrin J, Hydrocephalus Clinical Research Network. Risk factors for first cerebrospinal fluid shunt infection: findings from a multi-center prospective cohort study. J Pediatr. 2014 Jun;164(6):1462-8.e2. PubMed

Simon TD, Hall M, Riva-Cambrin J, Albert JE, Jeffries HE, Lafleur B, Dean JM, Kestle JR, Hydrocephalus Clinical Research Network. Infection rates following initial cerebrospinal fluid shunt placement across pediatric hospitals in the United States. Clinical article. J Neurosurg Pediatr. 2009 Aug;4(2):156-65. PubMed

### Extent of Measure Testing

Unspecified

## State of Use of the Measure

### State of Use

Current routine use

### Current Use

not defined yet

## Application of the Measure in its Current Use

### Measurement Setting

Hospital Inpatient

### Professionals Involved in Delivery of Health Services

not defined yet

### Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

### Statement of Acceptable Minimum Sample Size

Does not apply to this measure

### Target Population Age

Age less than or equal to 18 years

### Target Population Gender

Either male or female

## National Strategy for Quality Improvement in Health Care

### National Quality Strategy Aim

Better Care

### National Quality Strategy Priority

Making Care Safer
Prevention and Treatment of Leading Causes of Mortality

## Institute of Medicine (IOM) National Health Care Quality Report Categories

### IOM Care Need

Getting Better

Living with Illness

### IOM Domain

Effectiveness

Safety

## Data Collection for the Measure

### Case Finding Period

3-year rolling rate

## Denominator Sampling Frame

Patients associated with provider

## Denominator (Index) Event or Characteristic

Patient/Individual (Consumer) Characteristic

Therapeutic Intervention

## Denominator Time Window

not defined yet

## Denominator Inclusions/Exclusions

Inclusions
The total number of initial cerebrospinal ventriculoperitoneal (VP) shunt placements (International Classification of Diseases, Ninth Revision [ICD-9] procedure code 02.32, 02.33, 02.34 or 02.35 [either as a primary or secondary procedure]) among patients between the ages of 0 and 18 years at the time of procedure. Patients also have no evidence of VP shunt placement or removal in the year prior to their initial procedure.

Exclusions
Patients with evidence of VP shunt placement or removal in the year prior to their index procedure are excluded.

Note: Patients with evidence of VP shunt placement (identified by ICD-9 procedure codes 02.32, 02.33, 02.34 or 02.35 [either as a primary or secondary procedure]) or malfunction (identified by ICD-9 procedure codes [either as a primary or secondary procedure] 02.42 [Replacement of ventricular catheter or revision of ventriculoperitoneal shunt at ventricular site], 54.95 [Incision of Peritoneum — revision of VP shunt at peritoneal site], or the combination of codes 02.43 [Removal of ventricular shunt] and one of the following: 02.31, 02.32, 02.33, 02.34, 02.35, 02.36, 02.37, 02.38, or 02.39, during the same admission) in the year prior to their initial procedure are excluded.

## Exclusions/Exceptions

not defined yet

## Numerator Inclusions/Exclusions

Inclusions
Number of cases of initial ventriculoperitoneal (VP) shunt placement (International Classification of Diseases, Ninth Revision [ICD-9] procedure codes 02.32, 02.33, 02.34 or 02.35 [either as a primary or secondary procedure]) among patients between the ages of 0 and 18 years at the time of placement resulting in a malfunction characterized by a shunt revision within 30 days of initial procedure

Note: Shunt malfunction is identified by ICD-9 procedure codes (either as a primary or secondary procedure) 02.42 (Replacement of ventricular catheter or revision of ventriculoperitoneal shunt at ventricular site), 54.95 (Incision of Peritoneum — revision of VP shunt at peritoneal site), or the combination of codes 02.43 (Removal of ventricular shunt) and one of the following: 02.31, 02.32, 02.33, 02.34, 02.35, 02.36, 02.37, 02.38, or 02.39, during the same admission.

Exclusions
Unspecified

## Numerator Search Strategy

Fixed time period or point in time

## Data Source

Administrative clinical data

Electronic health/medical record

Paper medical record

Registry data

## Type of Health State

Adverse Health State

## Instruments Used and/or Associated with the Measure

Unspecified

# Computation of the Measure

## Measure Specifies Disaggregation

Does not apply to this measure

## Scoring

Rate/Proportion

## Interpretation of Score

Desired value is a lower score

## Allowance for Patient or Population Factors

not defined yet

## Description of Allowance for Patient or Population Factors

*Statistical risk model method and variables*: Logistic regression models used to determine the risk adjustment variables. The predicted value for each case is computed using a logistic regression model with covariates for age at insertion (0 to 30 days, 31 to 365 days, and equal to 1 year), congenital anomalies, intraventricular hemorrhage, low birth weight, prematurity and spina bifida. The reference population used in the regression is the Pediatric Health Information Systems (PHIS) database from 2008 to 2010.

## Standard of Comparison

not defined yet

# Identifying Information

## Original Title

Ventriculoperitoneal (VP) shunt malfunction rate in children.

## Submitter

Boston Children's Hospital - Hospital/Medical Center

## Developer

Boston Children's Hospital - Hospital/Medical Center

## Funding Source(s)

Unspecified

## Composition of the Group that Developed the Measure

Boston Children's Hospital: Liliana Goumnerova, MD (Neurosurgery); Sarah Jernigan, MD, MPH (Neurosurgery); Jay Berry, MD (Pediatrics); Dionne Graham, PhD (Biostatistician)

## Financial Disclosures/Other Potential Conflicts of Interest

None exist

## Adaptation

This measure was not adapted from another source.

## Date of Most Current Version in NQMC

2014 May

## Measure Maintenance

Routine measure maintenance will be performed in 2015.

## Date of Next Anticipated Revision

2015

## Measure Status

This is the current release of the measure.

The measure developer reaffirmed the currency of this measure in May 2016.

## Measure Availability

Source not available electronically.

For more information, contact the Boston Children's Hospital at 300 Longwood Avenue, Boston, MA 02115; Phone: 617-355-6000 or 800-355-7944; Web site: www.childrenshospital.org .

## NQMC Status

This NQMC measure summary was completed by ECRI Institute on February 20, 2015. The information was verified by the measure developer on May 13, 2015.

The information was reaffirmed by the measure developer on May 3, 2016.

## Copyright Statement



# Production

## Source(s)

Jernigan S, Berry JG, Graham D, Goumnerova L. Ventriculoperitoneal (VP) shunt malfunction rate in children. Boston (MA): Boston Children's Hospital, Center for Patient Safety and Quality Research; 2014 May 14. 4 p.

# Disclaimer

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